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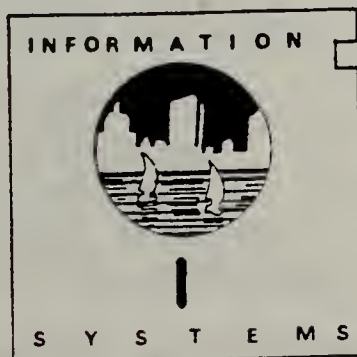
1988
AIR QUALITY REPORT

GOVERNMENT DOCUMENT
COLLECTION

JUL 8 1990

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PROJECT AUTHOR
ROBERT A. BOISSELLE



DIVISION OF AIR QUALITY CONTROL
(617) 292-5609

1988 AIR QUALITY REPORT
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I. INTRODUCTION

This report presents 1988 annual air quality data for Massachusetts, collected by the Division of Air Quality Control (DAQC), Department of Environmental Protection (DEP). Data collected by the Commonwealth is also submitted to the U.S. Environmental Protection Agency (EPA) for inclusion into the National Aerometric Data Bank. DAQC is responsible for measuring ambient air quality to verify compliance with state and national standards (see Table 1), to support development of regulations designed to reduce ambient air contaminants, to assess the effectiveness of existing air pollution control strategies, to provide aerometric data for special research and to fulfill EPA reporting requirements (40 CFR 50) for air quality data.* A site is considered in violation of the short term standards (e.g. 8 hour maximum) when the standard is exceeded two or more times in one year. In the case of ozone, a site is in violation if the hourly standard is exceeded four times in a three year span. Table 2 gives a brief description of the health and welfare effects of the six criteria air pollutants.

The Massachusetts network of public air monitoring stations, both urban and rural, are located throughout the state, at 40 sites. The stations are equipped with air pollution monitoring equipment (see Table 3) and, in some cases, meteorological equipment. The continuous state air pollution monitors record hourly levels of the four gaseous criteria pollutants - ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2). The non-continuous monitors record samples of 24 hour total suspended particulates (TSP), sulfate (SO_4), lead (Pb), and Particulate matter less than or equal to 10 microns (PM_{10}). Meteorological parameters measured, most

instances, include wind speed, wind direction and temperature. The Commonwealth's ambient air monitoring network is complemented by a private network of monitors. The private industrial sites are limited to monitoring sulfur dioxide, (SO_2), total suspended particulates, (TSP) wind-speed, wind direction and temperature.

Figures 2, 3, 5, 6, 7, 10 and 13 illustrate the Commonwealth's air pollution control regions and public monitoring networks maintained by DAQC in 1988 for the six criteria pollutants. TSP levels, replaced by PM_{10} as a particulate standard as of July 1988, are reported in Figure 8. Figures 4, 9 and 12 illustrate the private monitors in 1988 for SO_2 , SO_4 , and TSP.

This year, DAQC collected a total of 461,718 hourly samples at the public sites and 445,554 hourly samples at the private sites, for a total of 907,272. Daily Pollutant Standard Index values (April-October) were also determined for the Eastern, Central and Western portions of the state (see Table 14). The Commonwealth's data from public and private monitors have been summarized in this report for public record and information. For further information pertaining to this report and other related air quality problems, please contact either the Division of Air Quality Control at Boston (617)292-5630 or the Regional Offices.

AIR QUALITY REGIONAL SECTIONS

REGION 1 (Western)

John Higgins, Regional Director

Stephen Joyce, Deputy Regional
Environmental Engineer

John Kirzec, Acting Section Chief
State House West
436 Dwight Street
Springfield, MA 01103
(413) 785-5327

REGION 2 (Central)

Michael Maher Acting Regional
Director

Michael Maher, Deputy Regional
Environmental Engineer

Thomas Cusson, Section Chief-AQC
Grove St.
Worcester, MA 01605
(617) 791-3672

REGION 3 (Metropolitan/Northeast)

Ed Kunce, Regional Director

Richard Chalpin, Acting Deputy
Regional Environmental Engineer

James Belsky, Section
Chief-AQC
5 Commonwealth Avenue
Woburn, MA 01801
(617) 935-2160

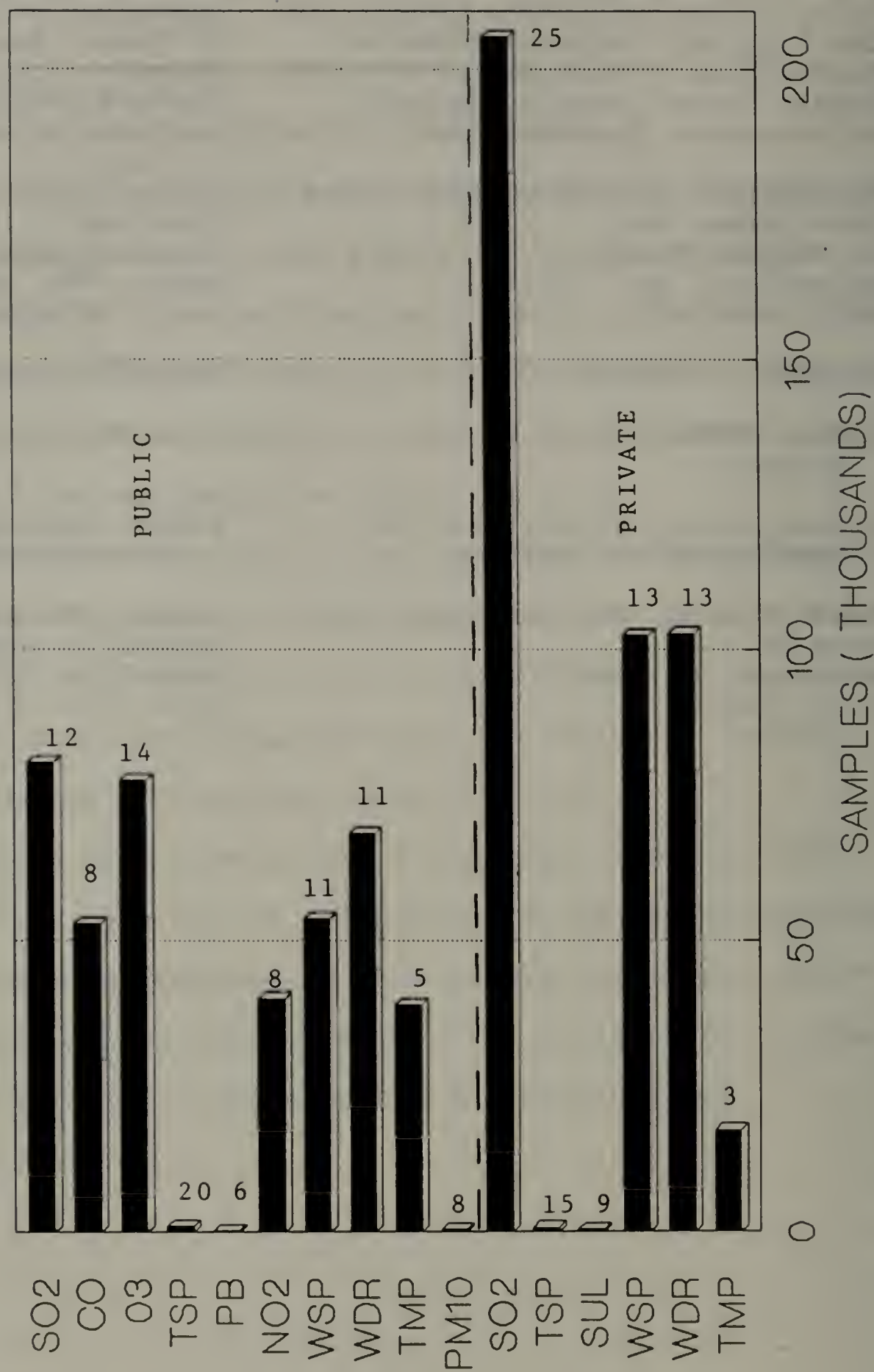
REGION 4 (Southeast)

Gilbert Joly, Regional Director

Robert Donovan, Deputy Regional
Environmental Engineer

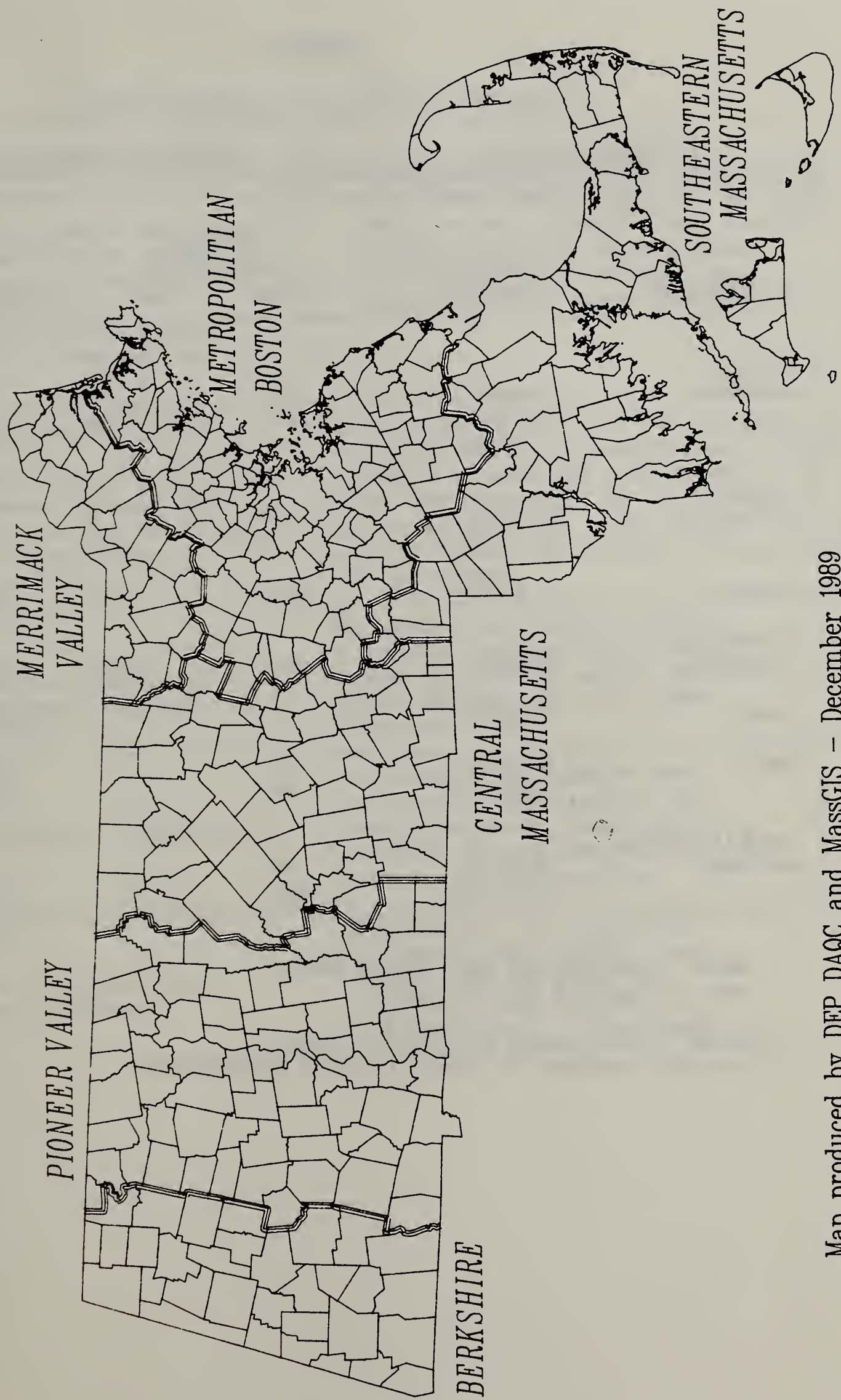
Vaughan Steeves, Section Chief-AQC
Lakeville Hospital
Lakeville, MA 02347
(617) 947-1231

NUMBER OF SITES AND SAMPLES IN THE MONITORING NETWORK 1988



12 = Number of Monitoring Sites
SO2 = Sulfur Dioxide
CO = Carbon Monoxide
O3 = Ozone
WSP = Wind Speed
WDI = Wind Direction
TMP = Temperature
SUL = Sulfates
TSP = Total Particulates
PB = Lead
NO2 = Nitrogen Dioxide
PM10 = Particulate 10 micron

FIGURE 2: Massachusetts Air Pollution Control Regions



Map produced by DEP DAQC and MassGIS - December 1989

TABLE 1

STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS					
POLLUTANT	AVERAGING INTERVAL	PRIMARY STANDARD		SECONDARY STANDARD	
		ug/m ³	ppm	ug/m ³	ppm
Sulfur Dioxide	Annual	80	0.03	-	-
	24 hour	365	0.14	-	-
	3 hour	-	-	1,300	0.5
Carbon Monoxide	8 hour	10*	9	10*	9
	1 hour	40*	35	40*	35
Ozone	1 hour	240	0.12	240	0.12
Nitrogen Dioxide	Annual	100	0.05	100	0.05
Lead	3 month	1.5	-	1.5	-
PM??	Annual	50	-	50	-
	24 hour	150	-	150	-
Particulate Matter	Annual	75	-	60**	-
	24 hour	260	-	150	-

ug/m³ micrograms per cubic meter
 ppm - parts per million

*mg/m³ milligrams per cubic meter

**annual average is considered a guideline

TABLE 2

HEALTH EFFECTS OF AIR POLLUTANTS

POLLUTANTS AND THEIR SOURCES	HEALTH EFFECTS
I Ozone	Breathing difficulty especially I
I	when exercising, irritates eyes I
I when exercising, irritates eyes	respiratory infections. Acute I
I Product of reactions of motor	exposures cause bronchocon- I
I vehicle exhaust, industrial	striction, lung edema, and I
I process emissions and	abnormal lung development. I
I other fossil fuel combustion	I
I emissions in the presence of	I
I sunlight.	I
I-----	I-----
I Total Suspended Particulates	Critical for those with chronic I
I	lung diseases, altering the lungs' I
I Fossil fuel combustion emissions,	natural cleansing mechanism. I
I industrial process emissions,	They are composed of or adsorb to I
I motor vehicle exhaust, traffic	toxic materials. Particles I
I movement over dusty roads.	smaller than 10 microns lodge deep I
I	in the lungs. I
I-----	I-----
I Carbon Monoxide	Reduces the blood's ability I
I	to carry oxygen which may I
I Internal combustion engines,	cause heart and brain damage. I
I fossil fuel combustion, and	Acute exposures can cause I
I cigarette smoking.	asphyxiation. I
I-----	I-----
I Sulfur Dioxide	Irritation of throat and I
I	lungs and aggravation of I
I Fossil fuel combustion emissions.	symptoms among those with I
I	chronic lung diseases such as I
I	asthma and bronchitis. I
I-----	I-----
I Nitrogen Dioxide	Aggravation of symptoms I
I	in those with asthma and I
I Emitted from motor vehicles	chronic bronchitis and I
I and fossil fuel burning	increased susceptibility I
I operations.	to respiratory infections. I
I-----	I-----

TABLE 2: (Cont.)

HEALTH EFFECTS OF AIR POLLUTANTS

POLLUTANTS AND THEIR SOURCES		HEALTH EFFECTS
Lead		Mental retardation, brain and other organ damage.
Emitted from motor vehicle exhausts, some incinerators and smelters.		
Sulfate		Enhanced respiratory toxicity of other air pollutants, chronic bronchitis and asthmatic attacks, and exacerbation of existing respiratory disease.
Emitted by coal and oil combustion, becomes the principal oxidation product of sulfur dioxide released into the atmosphere.		

TABLE 3

ANALYSIS COLLECTION METHOD LISTING*

Sulfur Dioxide:			
14	Coulometric		
20	Pulse Fluorescent Instrumental		P. 20
Carbon Monoxide:			
11	Non-Dispersive Infra-Red Instrumental		P. 26
Ozone:			
11	Chemiluminescence Instrumental		
14	Ultraviolet Photometric		P. 29
Nitrogen Dioxide:			
14	Chemiluminescence Instrumental		P. 32
Total Suspended Particulates:			
91	High Volume Air Sampler		P. 35
Lead:			
92	High Volume Air Sampler		P. 41
Sulfate:			
91	High Volume Air Sampler		P. 49
PM10:			
01	Low Volume	Gravimetric	SA244E
52	High Volume	Gravimetric	SA321A
58	High Volume	Gravimetric	SA321B
			P. 51

* Corresponds to Instrument Method in Data Summaries.

TABLE 4 LIST OF EXCEEDANCES - PUBLIC SITES

POLLUTANT	LOCATION	ADDRESS	SAROAD	MO.	DAY	TIME	LEVEL REACH

Carbon Monoxide							
(8 Hr Average)	N O	E X C E E D A N C E S	R E C O R D E D				
(1 Hr Average)	N O	E X C E E D A N C E S	R E C O R D E D				

Nitrogen Dioxide							
(Annual)	N O	E X C E E D A N C E S	R E C O R D E D				

Lead							
(Quarterly)	N O	E X C E E D A N C E S	R E C O R D E D				

TSP							
(Annual)	Charlestown	One City Sq.	0240-027			xxxx	103 ug
(24 Hr Average)	Charlestown	One City Sq.	0240-027	10	24	xxxx	410 ug

Sulfur Dioxide							
(Annual)	N O	E X C E E D A N C E S	R E C O R D E D				
(24 Hr Average)	N O	E X C E E D A N C E S	R E C O R D E D				
(3 Hr Average)	N O	E X C E E D A N C E S	R E C O R D E D				

Ozone							
(Daily Hr Max)	Chelsea	Powder Horn Hill	0380-003	07	08	1300	.150 pp
				08	02	1300	.150 pp
				06	16	1200	.141 pp
				06	13	1400	.136 pp
				08	14	1800	.130 pp
				07	11	1000	.127 pp
	Chicopee	Anderson Road	0400-008	06	22	1800	.192 pp
		Westover AFB		07	08	1300	.167 pp
				06	16	1500	.160 pp
				07	06	1600	.159 pp
				07	07	1800	.158 pp
				07	14	1000	.156 pp
				08	03	1600	.151 pp
				06	19	1800	.137 pp
				06	20	1600	.136 pp
				05	28	1800	.135 pp
				08	02	1700	.134 pp
				07	26	1300	.129 pp
				08	10	1700	.125 pp

TABLE 4 LIST OF EXCEEDANCES - PUBLIC SITES 1988 (Cont.)

POLLUTANT	LOCATION	ADDRESS	SAROAD	MO.	DAY	TIME	LEVEL REACHED
OZONE	Agawam	S. Westfield St.	0030-003	06	22	1800	.182 ppm
				07	06	1400	.151 ppm
				07	16	1600	.149 ppm
				07	14	1400	.144 ppm
				07	08	1700	.142 ppm
				07	07	1300	.142 ppm
				06	16	1500	.139 ppm
				06	19	1700	.128 ppm
				08	11	1900	.125 ppm
	Amherst	N. Pleasant St.	0060-003	07	16	1700	.165 ppm
				07	14	1500	.162 ppm
				08	03	1800	.140 ppm
				07	08	1400	.135 ppm
				06	20	1700	.132 ppm
				06	16	1300	.130 ppm
				07	07	1900	.125 ppm
	Easton-No.	Post Office Main Street	0535-001	07	11	1800	.153 ppm
				08	15	1400	.129 ppm
	Fairhaven	Leroy Wood	0570-002	07	11	1500	.180 ppm
				07	30	1900	.161 ppm
				07	29	1900	.160 ppm
				06	15	1500	.150 ppm
				06	14	1900	.133 ppm
				08	07	1600	.125 ppm
	Gloucester	Eastern Point Light House	0740-002	06	15	1300	.170 ppm
				07	30	1300	.165 ppm
				06	14	1400	.150 ppm
				06	16	1400	.146 ppm
				08	12	1400	.143 ppm
				07	07	1400	.135 ppm
				07	11	2300	.131 ppm
				07	08	1400	.126 ppm
	Lawrence	High Street Storrow Park	1000-005	08	02	1500	.144 ppm
				06	22	1800	.128 ppm
				07	07	1500	.126 ppm
				07	06	1200	.125 ppm
	Newburyport	NWR HG Plum Island	1520-003	07	08	1300	.180 ppm
				08	03	1400	.159 ppm
				07	11	1200	.158 ppm
				06	16	1400	.139 ppm
				08	02	1400	.134 ppm
				07	06	1300	.128 ppm
				07	10	1400	.127 ppm

 TABLE 4 LIST OF EXCEEDANCES - PUBLIC SITES 1988

POLLUTANT	LOCATION	ADDRESS	SAROAD	MO.	DAY	TIME	LEVEL REACHED
OZONE	Scituate	Police Dept.	2020-001	06	13	1400	.152 ppm
				07	11	1200	.151 ppm
				06	15	1500	.136 ppm
				06	16	1300	.133 ppm
				07	06	1300	.132 ppm
				06	14	1300	.125 ppm
	Sudbury	Watertown Road	2196-001	08	14	1800	.170 ppm
				06	22	1800	.169 ppm
				07	08	1500	.151 ppm
				07	06	1200	.146 ppm
				08	03	1600	.146 ppm
				08	13	2100	.136 ppm
				08	11	1300	.136 ppm
				07	11	0900	.136 ppm
				06	16	1600	.132 ppm
				08	10	1300	.127 ppm
	Truro	Fox Bottom	2275-001	07	11	1600	.182 ppm
				06	15	1300	.158 ppm
				07	30	2100	.158 ppm
				06	21	2100	.146 ppm
				06	14	2100	.145 ppm
				07	31	0000	.135 ppm
				08	13	1000	.128 ppm
				07	10	1400	.126 ppm
				08	07	1900	.125 ppm
				08	12	2300	.125 ppm
				07	29	2300	.125 ppm
	Ware	Quabbin Summit	2360-002	06	22	1800	.213 ppm
				07	16	1700	.176 ppm
				06	16	1500	.167 ppm
				08	03	1700	.153 ppm
				07	16	1600	.148 ppm
				07	10	2000	.147 ppm
				07	14	1800	.145 ppm
				05	28	1500	.145 ppm
				08	02	1700	.142 ppm
				06	20	1700	.139 ppm
				07	07	1900	.138 ppm
				06	19	1800	.137 ppm
				07	08	1800	.136 ppm
				07	26	1300	.129 ppm
				08	11	2000	.127 ppm
				08	09	1800	.125 ppm
				08	10	1700	.125 ppm

TABLE 4 LIST OF EXCEEDANCES - PUBLIC SITES 1988
Continued

POLLUTANT	LOCATION	ADDRESS	SAROAD	MO.	DAY	TIME	LEVEL REACHED
OZONE	Worcester	DPW-Yard	2680-001	07	08	1800	.136 ppm
				07	26	1300	.179 ppm
				08	11	2000	.127 ppm
				08	09	1800	.125 ppm
				08	10	1700	.125 ppm
				06	22	1600	.171 ppm
				08	14	1800	.139 ppm

PM10

(Annual)	NO EXCEEDANCES RECORDED
(24 Hr. Average)	NO EXCEEDANCES RECORDED

THE JOURNAL OF THE ROYAL ANTHROPOLOGICAL INSTITUTE

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ORIGINAL ARTICLES						
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THE	THE	THE	THE	THE	100	100

II. PUBLIC SITE DIRECTORY - 1988

CITY SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED						
					SO2	CO	O3	NO2	TSP	Pb	PM1

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)											
Agawam 152 South West- field St.	0030-003	692120 4659040	3	Rural Agri- culture			X				
Amherst N. Pleasant St.	0060-003	703800 4696975	3	Rural - Agricultural			X				
Chicopee Anderson Rd. Westover	0400-008	701800 4674020	3	Suburban - Commercial			X				
Holyoke 1 Court Square	0860-007	697480 4675170	12	Center City- Commercial					X		
Springfield 1586 E. Columbus	2160-007	699150 4663550	6	Center City- Industrial		X				X	X
Springfield Longhill Ave (Substations)	2160-009	700193 4661928	6	Center City- Commercial	X						
Springfield 59 Howard St. School	2160-011	699460 4663380	18	Center City- Commercial					X	X	X
Springfield Fernbank St.	2160-014	707080 4668200	4	Suburban - Commercial WS WD Temp		X					
Springfield Community Tech.	2160-015	700000 4664500	15	Center City- Residential	X			X			
Springfield 1400 State St.	I2160-017I	I700000 I I4666000 I	I I	ICenter City-I IResidential I	I I	I I	IX I	I I	I I	I I	I I
Ware Quabbin Summit	2360-002	719700 4686150	5	Rural Agriculture WS, WD, Temp SO?, NO	X		X	X	X		X
West Springfield Van Deene St.	I2475-003I	I696400 I I4663940 I	I7 I	ISuburban - I	I I	I I	I I	I I	I I	I I	I I

 II. PUBLIC SITE DIRECTORY - 1988

CITY SITE LOCATION	SAROAD # I	UTM COORD EAST INORTH	REC HGT I (M) I	STATION TYPE	POLLUTANTS I SAMPLED I SO2 I CO I O3 I NO2 I TSP I Pb I PM
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CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)

Worcester 419 Belmont St. UMASS	2640-013	272400 4683700	5	Center City Residential						X		
Worcester 2 Washington St. YWCA	2640-016	269100 4682200	8	Center City Commercial						X	X	X
Worcester State DPW Yard, Belmont Ave.	2640-019	272303 4683788	6	Center City Residential, WS, WD, Temp	X		X					
Worcester Thomas St. Fire Station	2640-020	269300 4683000	3	Center City Commercial, NO	X	X			X			

II. PUBLIC SITE DIRECTORY - 1988

CITY SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED						
					SO2	CO	O3	NO2	TSP	Pb	PM1

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Boston Kenmore Square 590 Comm. Ave.	0240-002	327100 4690400	3	Center City Commercial NO, Temp	X	X		X		X	X
Boston Southampton St. Fire HQ	0240-012	329580 4688230	12	Center City Commercial					X		
Boston Visconti Street Callahan Tunnel	0240-016	332000 4692500	5	Center City Residential		X					
Boston 340 Breman St. E. Boston	0240-021	330000 4693550	4	Center City Residential NO	X	X		X	X		
Boston Essex St.	0240-022	330100 4690750	4	Center City Commercial		X					
Boston 200 Columbus Ave.	0240-024	329400 4690350	5	Center City Commercial					X		X
Boston One City Square Charlestown	0240-027	330100 4693030		Center City Residential					X	X	X
Chelsea Power Horn Hill	0380-003	3399000 46961500	4	Center City Residential WS, WD, NO	X		X	X	X		
Gloucester Eastern Pt. Light.	0740-002	363895 47052660	7	Suburban Residential			X				
Medford 100-120 Main St. Fire Headqtrs.	1220-002	326300 4697990	6	Center City Commercial					X		

II. PUBLIC SITE DIRECTORY - 1988

CITY SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED						
					SO2	CO	O3	NO2	TSP	Pb	PM1

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119) (Cont.)

Quincy Hancock St., Atlantic Fire Station	1880-007	332400 4682100	3	Suburban Residential						X	
Sudbury Watertown Rd. Natl. Wildlife	2196-001	303350 4695100	5	Rural Agricultural WS WD Temp			X				
Watertown Victory Field	2380-005	3203100 46935000	4	Center City Residential	X					X	
Woburn Pleasant St. Court House	2620-002	323000 4705000	12	Suburban Commercial						X	

MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Lawrence High St. Storrow Park	1000-005	342220 4730590	4	Center City Residential WS, WD	X		X			X	X
Lowell 35 YMCA Drive	1080-006	310370 4722640	7	Center City Commercial						X	X
Newburyport NWR H Quarters Plum Island	1520-003	351300 4741600	4	Suburban Residential WS WD			X				

SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)

Brockton Crescent Street	0320-003	333300 4660400	10	Center City Industrial						X	
Easton-North 300 Main St.	0535-001	327050 4659170	5	Rural Near Urban			X				

 II. PUBLIC SITE DIRECTORY - 1988

CITY SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED						
					SO2	CO	O3	NO2	TSP	Pb	PM1

SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120) .. (Cont.)											
Fairhaven Leroy Wood School	0570-002	343330 4610800	4	Suburban Residential WS WD				X			
Fall River 165 Bedford St.	0580-001	321000 4618000	15	Center City Commercial Temp						X	
Fall River Globe St.	0580-004	319700 4616900	5	Center City Commercial WS WD Temp	X						
New Bedford 25 Water St. YMCA	1500-004	3395000 46101100	16	Center City Commercial						X	
Scituate First Ponsh Rd - Police Dept.	2020-001	354000 46730000	15	Suburban Residential				X			
Truro Fox Bottom Nat'l Seashore	2275-001	4158000 46475000	10	Rural				X			

II. PRIVATE SITE DIRECTORY - 1988

SITE LOCATION	SAROAD #	UTM COORD	REC	STATION	POLLUTANTS					
		EAST	HGT	TYPE	SAMPLED					
		NORTH	(M)		SO2	SO4	W/S	W/D	TSP	TEMP

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)										
Chicopee Grattan & Meadow	0400-006	697069 4672615	5	Suburban		X				X
Hadley Russell St. Hopkin Academy	0789-001	698398 4690214	3	Rural	X					
Hadley Summit House Mt. Holyoke	0789-002	629160 4685971	5	Rural	X					
Holyoke Mt. Tom Power Plant	0860-005	697554 4683012	3	Rural	X		X	X		
Northampton Elm St. Smith College	1600-003	694660 4687790	11	Center City		X				X

II. PRIVATE SITE DIRECTORY - 1988

SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO2	SO4	W/S	W/D	TSP	TEMP

PIONEER VALLEY AIR QUALITY CONTROL REGION (042) (Cont.)

South Hadley Pine St. Sub- Station	2126-002	699012 4679687	3	Suburban	X					
South Hadley 23 Granview Street	2126-003	699400 4676600	3	Suburban	X		X	X		
Springfield Longhill Sub- Station	2160-009	700193 4661928	6	Center City	X	X				X
Springfield Carew St. Sub-Station	2160-010	699855 4666415	4	Suburban	X					
Springfield Civic Center Rooftop	2160-012	699462 4663692	21	Center City		X				X
Springfield Rose St. & Page Blvd.	2160-013	702346 46683460	5	Center City		X				X
W. Springfield Agawam Ave. Power Plant	2475-002	698639 4662867	3	Center City	X					
W. Springfield Agawam Ave. Base Station	2475-004	699100 4662810	5	Center City	X					
W. Springfield Agawam Ave. #2	2475-005	699100 4662800	5	Center City	X					
W. Springfield Agawam Ave. #3	2475-006	699100 4662750	5	Center City	X					

 II. PRIVATE SITE DIRECTORY - 1988

SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO2	SO4	W/S	W/D	TSP	TEMP

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Beverly E. Lothrop St.- Central Cemetery	0220-002	346600 4712400	3	Center City	X					X
Boston 476 Atlantic Ave.	0240-018	330760 4690790	3	Center City	X	X				X
Boston Long Island	0240-019	337595 4686595	5	Rural	X	X	X	X		X
Boston Dewar St. Dorchester	0240-020	330548 4685952	6	Center City	X	X	X	X		X
Boston Breman St. E. Boston	0240-021	332696 4693440	3	Center City	X	X	X	X		X
Lynn 436 Lynnway St. GECO	1100-003	339171 4701463	-	Center City	X		X	X		X
Marblehead Green St.	1160-003	347395 4707922	3	Suburban	X					X
Peabody Meadow Pond - Glen Rd.	1780-004	341340 4708630	3	Suburban	X		X	X		
Peabody Fox Hill - Perkins St. Playground	1780-005	341130 4709640	3	Suburban	X		X	X		
Salem Fort Ave. Power Transm. NEPC	1980-004	345900 4710100	3	Suburban			X	X		X

 II. PRIVATE SITE DIRECTORY - 1988

SITE LOCATION	SAROAD #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO2	SO4	W/S	W/D	TSP	TEMP

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (Cont.) (119)

Stoneham Hill St. Hillside Garden Apts.	2180-001	326462 4704385	12	Suburban	X		X	X		
Wellesley Whitin Obs. Wellesley College	2420-001	310150 4684780	4	Suburban	X				X	

SOUTHEAST MASSACHUSETTS AIR QUALITY CONTROL REGION (120)

Fall River Globe & Wilcox	0580-010	318960 4617230	3	Center City	X					
Fall River Manton & Second Street	0580-014	320020 4617400	30	Urban					X	
Swansea Sharps Lot Road	2230-001	317300 4624600	3	Suburban	X		X	X	X	X

MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Haverhill Borman St. Nettle School	0840-002	3313850 47373650	9	Center City Residential	X		X	X		
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A. SULFUR DIOXIDE (SO₂)

1. Sampling Method

The pulse fluorescent instrument is used to analyze continuous SO₂ concentrations. In the pulse fluorescent method, SO₂ molecules are excited by ultra-violet light. In the process, the molecules emit distinctive light waves which vary in intensity according to the SO₂ concentration. The intensity is then measured to find specific SO₂ concentrations. The sampling method meets EPA equivalency requirements in 40CFR 50.1 (1981).

2. Summary of Data

In 1988, twelve (12) SO₂ monitors were in the state-operated network (Figure 3). All of these sites operated at 75 percent or greater data capture except for Chelsea (0380-003), no violations of the National Ambient Air Quality Standards (NAAQS) for SO₂ were recorded in 1988. Table 5 shows that the highest annual average (47 ug/M³) was in the Metropolitan Boston urban area (0240-002). In 1988, data from 25 privately operated SO₂ monitors was quality assured and submitted to DAQC (Figure 4). All of these sites operated at 90 percent data capture or greater except for Beverly (0220-002). No violations of the NAAQS were recorded. Table 6 shows that the highest annual average (39 ug/M³) occurred at West Springfield (2475-006).

(3) TABLE 5 - PUBLIC SITES

1988 SULFUR DIOXIDE MONITORING RESULTS

SO2 units: ug/m3

Daily

City	Saroad Site#	Instru- ment Method	Number of Hourly obs.	Annual Arith. Mean	Maximum 24 hr. obs Block		Maximum 3 Hr obs Block		Maximum 1Hr obs	
					1st	2nd	1st	2nd	1st	2nd

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Sprngfld.	2160-009	20	8045	31	165	152	280	249	383	374
Sprngfld.	2160-015	20	7130	31	233	194	385	262	539	335
Sprngfld.	2160-016	20	626	*	159	134	196	196	100	100
Ware	2360-002	20	8613	11	110	89	139	126	152	149

CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)

Worcester	2640-019	20	8649	16	115	86	131	114	155	152
Worcester	2640-020	20	8454	24	115	110	223	202	265	262

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Boston	0240-002	20	6848	47	181	149	333	306	366	359
Boston	0240-021	20	8569	34	175	147	296	278	367	348
Chelsea	0380-003	20	6367	34	186	142	276	267	335	322
Watertown	2380-005	20	8711	21	152	141	283	254	304	293

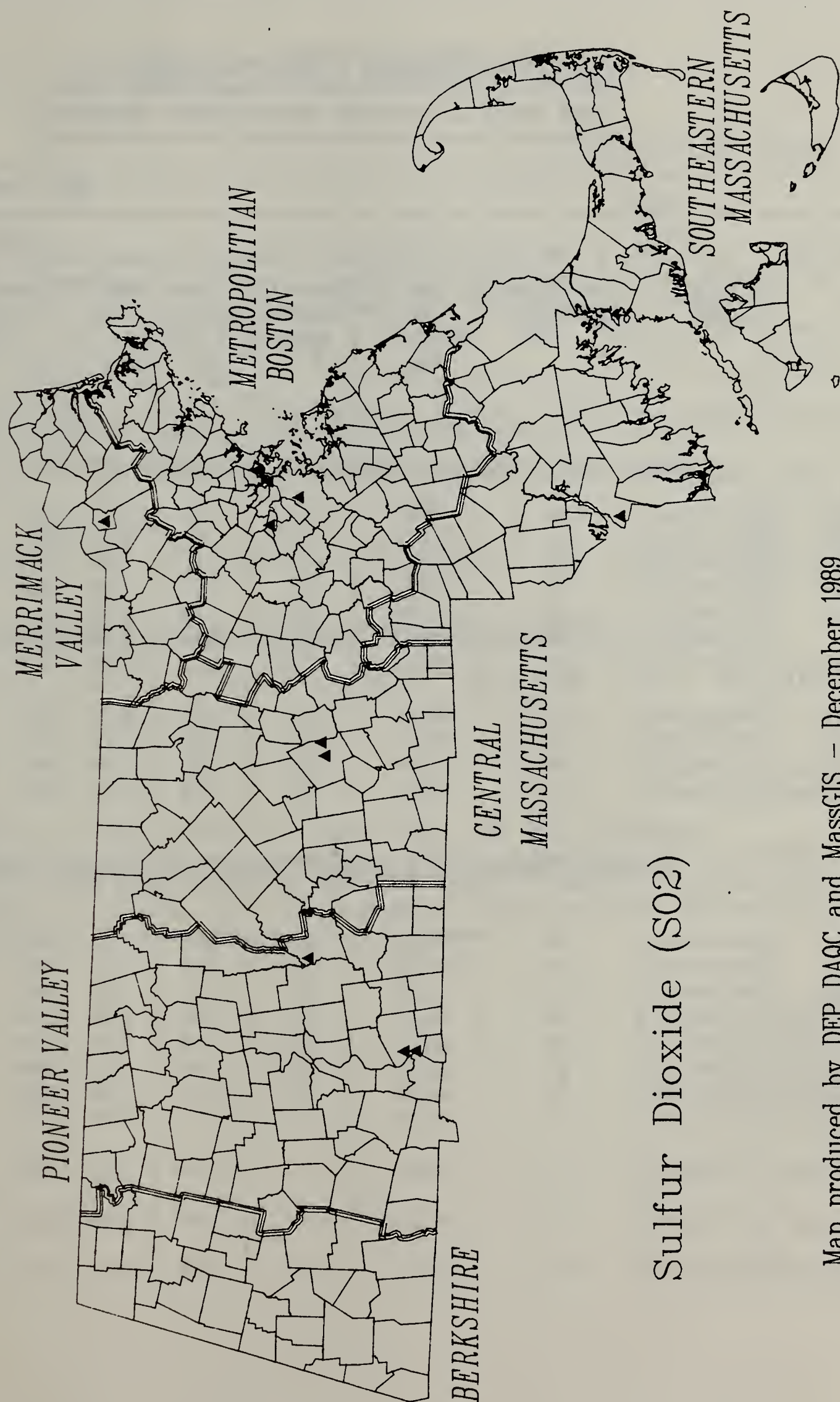
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)

Fall River	0580-004	20	8264	26	115	105	262	260	419	380
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MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Lawrence	1000-005	20	8493	26	128	107	209	188	275	254
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FIGURE 3: Continuous Air Sampling Network – Public 1988



Sulfur Dioxide (SO₂)

Map produced by DEP DAQC and MassGIS – December 1989

(5) TABLE 6 - PRIVATE SITES

1988 SULFUR DIOXIDE MONITORING RESULTS

SO2 units: ug/m3

Daily

City	Saroad Site#	Instrument Method	Number of Hourly obs.	Annual Arith. Mean	Maximum 24 hr. obs. Block		Maximum 3 Hr. obs. Block		Maximum 1 Hr. obs.	
					1st	2nd	1st.	2nd.	1st.	2nd.

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Beverly	0220-002	20	4344	*	149	107	223	202	244	236
Boston	0240-018	20	8338	37	173	142	267	215	299	270
Boston	0240-019	20	8112	26	131	97	212	183	256	246
Boston	0240-020	20	8176	29	147	110	238	236	267	259
Boston	0240-021	20	8239	34	170	134	270	257	388	359
Lynn	1100-003	20	8367	29	176	160	437	417	539	527
Marble- head	1160-003	20	8736	24	136	123	210	194	259	246
Peabody	1780-004	20	8427	31	165	157	333	325	333	333
Peabody	1780-005	20	8631	26	152	118	385	249	461	430
Stoneham	2180-001	20	8438	29	160	139	367	312	414	409
Wellesley	2420-001	20	7922	18	102	100	207	170	259	238

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Hadley	0789-001	20	8355	29	131	131	262	233	328	325
Hadley	0789-002	20	8351	34	215	181	456	325	1195	833
Holyoke	0860-005	20	8415	26	123	115	197	191	409	328
S. Hadley	2126-002	20	8411	26	166	155	270	228	328	286
S. Hadley	2126-003	20	8490	13	136	118	223	197	275	249
Springfld	2160-009	20	8451	42	168	152	354	307	422	383
Springfld	2160-010	20	8423	37	212	189	275	267	417	364
W.Spring- field	2475-002	20	7899	31	191	155	333	293	440	414
W.Spring- field	2475-004	20	8522	34	194	155	293	288	411	398
W.Spring- field	2475-005	20	8515	37	194	149	299	231	427	330
W.Spring- field	2475-006	20	8371	39	178	157	280	254	390	385

(5) TABLE 6 - PRIVATE SITES (Cont.)
1988 SULFUR DIOXIDE MONITORING RESULTS

SO2 units: ug/m3

Daily

City	Saroad Site#	Instrument Method	Number of Hourly obs.	Annual Arith. Mean	Maximum 24 hr. obs. Block		Maximum 3 Hr. obs. Block		Maximum 1 Hr. obs.	
					1st	2nd	1st.	2nd.	1st.	2nd.

SOUTHEASTERN VALLEY AIR QUALITY CONTROL REGION (120)

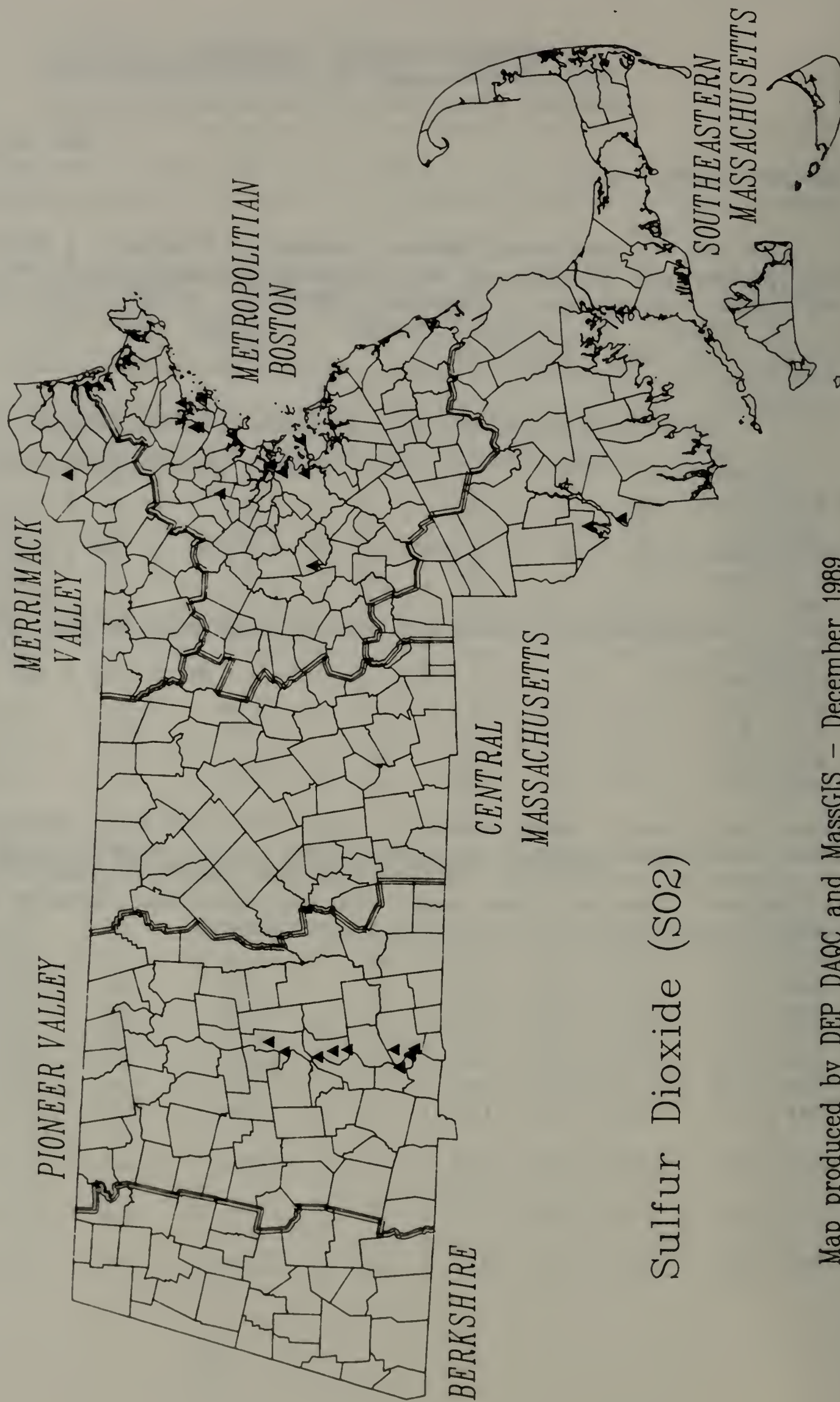
Fall River	0580-010	20	8734	29	225	165	443	351	542	477
Swansea	2230-001	20	8647	18	241	89	670	655	914	856

MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Haverhill	0840-002	20	8286	16	60	55	92	89	107	102
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- * Annual Arithmetic Mean based on less than 75% data capture.
- ** When total observations are less than 6,250, sample size is insufficient to represent sound data results for the year. Sulfur dioxide data are collected throughout the year; 100 percent data capture during this period represents 8,760 hourly observations.

FIGURE 4: Continuous Air Sampling Network – Private 1988



Sulfur Dioxide (SO₂)

Map produced by DEP DAQC and MassGIS – December 1989

B. Carbon Monoxide (CO)

1. Sampling Method

DAQC uses non-dispersive infrared (NDIR) analyzers for CO detection. These analyzers employ a short cell NDIR detection principle coupled with water vapor subtraction. This methodology meets equivalency requirements published by EPA in 40CFR 50.8, (1981).

2. Summary of Data

DAQC operated eight (8) CO monitors in 1988 (Figure 5). No violations of the one-hour CO National Ambient Air Quality Standards (40 mg/m^3) (NAAQS) were recorded in 1988. Table 7 shows that the maximum hourly CO value was 20 mg/m^3 at Lowell (1080-007). The 8-hour standard (10 mg/m^3) was exceeded once in 1988, but not violated. To report a violation of the CO standard, two exceedances must be recorded at a single site. Both Lowell (1080-007) and Springfield (2160-007) recorded the highest eight-hour average concentration (11 mg/m^3 , 10 mg/m^3).

(3) TABLE 7 - PUBLIC SITES

1988 CARBON MONOXIDE MONITORING RESULTS

CO Units: mg/m3

City	Saroad Site #	Instrument Method	Number of Hourly obs.	Maximum 1st 1hr.	Maximum 2nd 1 hr.	Maximum 1st 8 hr	Maximum 2nd 8 hr	# of 8 hr aver- ages above 10 mg/m?
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PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Springfield	2160-007	11	8469	13	12	10	7	0
Springfield	2160-014	11	7951	7	7	5	4	0

CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)

Worcester	2640-020	11	8441	18	16	9	6	0
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METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

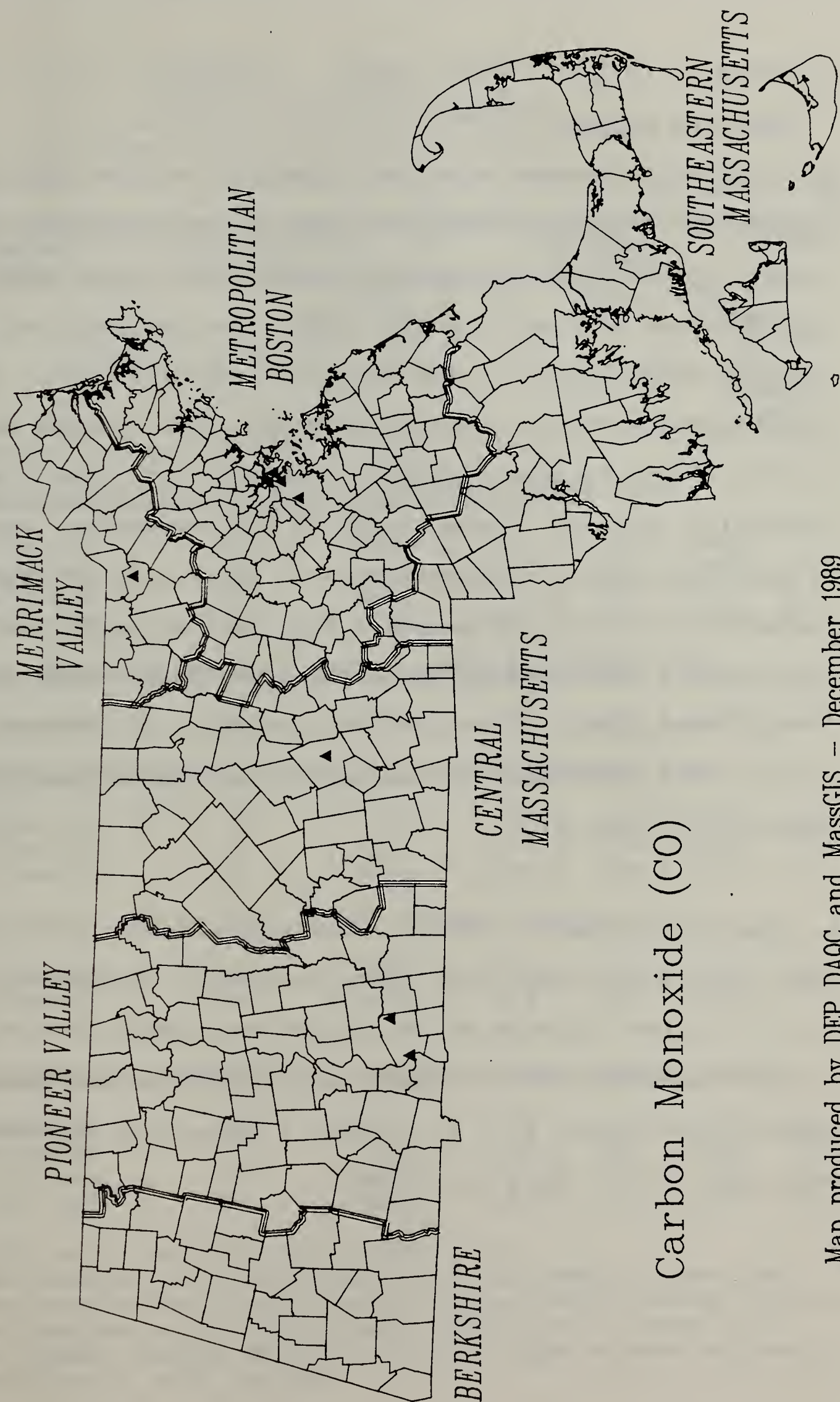
Boston	0240-002	11	6980	14	10	6	6	0
Boston	0240-016	11	8256	19	18	7	6	0
Boston	0240-021	11	8673	10	10	6	5	0
Boston	0240-022	11	4050	18	12	7	7	**

MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Lowell	1080-007	11	8383	20	18	11	7	1
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** When total observations are less than 6,570, the sample cannot be guaranteed to contain the actual maximum concentration value for the year. An observation is a single hourly reading at a site. Carbon monoxide data are collected throughout the year; 100 percent data capture during this period represents 8,760 hourly observations.

FIGURE 5: Continuous Air Sampling Network – Public 1988



C. Ozone (O_3)

1. Sampling Method

The chemiluminescence detection principle and the ultraviolet photometric analyzer method are used in the continuous measurement for ozone. In the chemiluminescence method, the ozone reacts chemically with ethylene gas, which emits light. The intensity of the emitted light is proportional to the amount of ambient ozone. In the ultraviolet method, the ultraviolet photometer gauges ozone concentrations by measuring the attenuation of light from ozone in the adsorption cell at a wave length of 254 nanometers. The concentration of ozone is inversely proportional to the amount of light being transmitted through the sample. Both methodologies meet equivalency requirements published by EPA 40CFR 50.9 (1981). The ozone season covers seven months of monitoring from April to October. During this period the highest peak of sunlight is available to mix and alter chemicals in the air.

2. Summary of Data

DAQC operated fourteen (14) ozone monitoring stations in 1988 (Figure 6). All sites operated at 85 percent or greater data capture. At fourteen stations the .120 parts per million 1-hour standard was exceeded (See Table 4, p.9). Table 8 shows that the maximum ozone value was .213 at Ware (2360-002).

(3)TABLE 8 - PUBLIC SITES

1988 OZONE MONITORING RESULTS

03 units = ppm

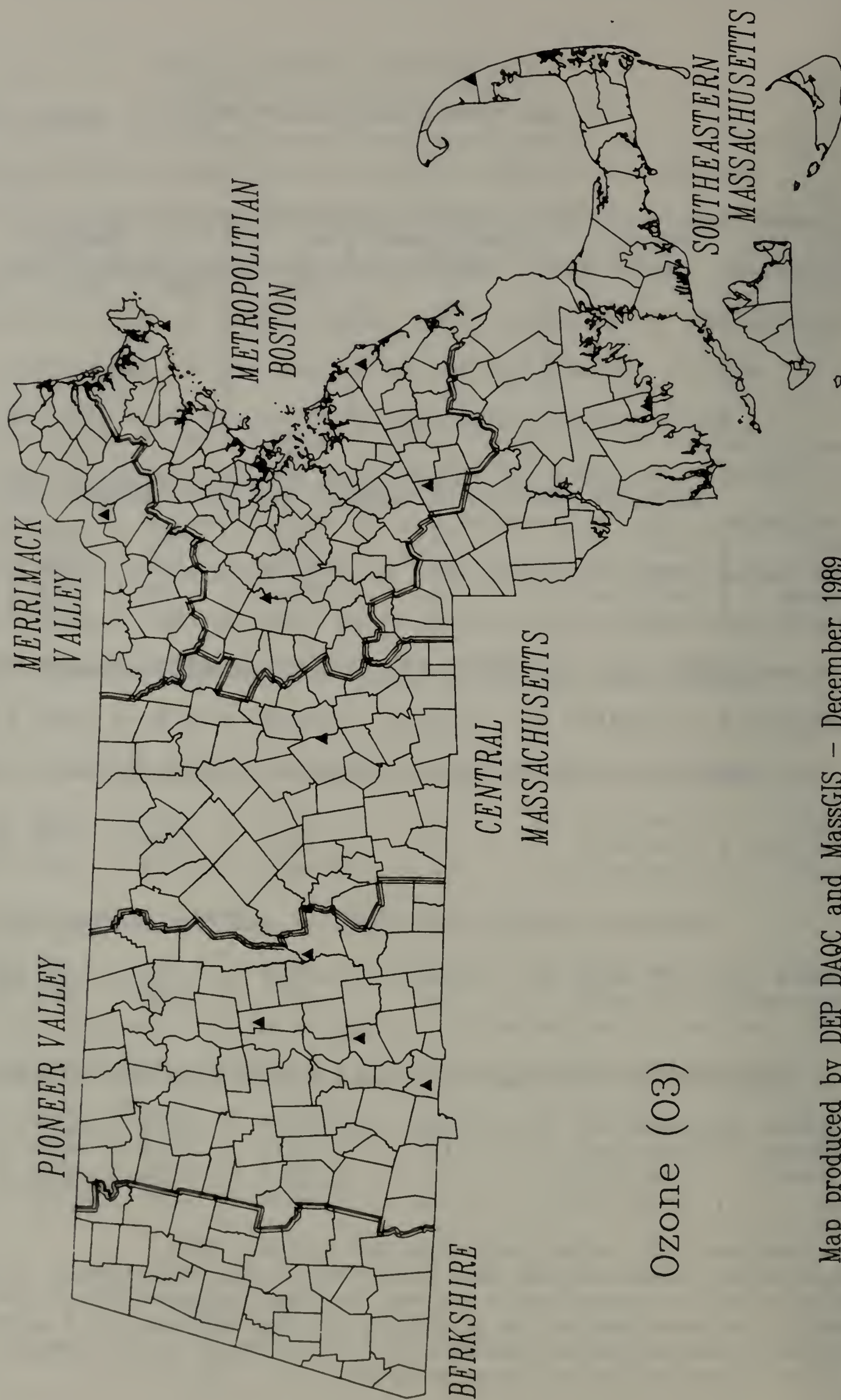
City	Saroad Site #	Instrument Method	# of obs.	Maximum 1 Hr. Obs.			Values = > .125 mea- sured for Daily Max
				1st	2nd.	3rd.	

<u>PIONEER VALLEY AIR QUALITY CONTROL REGION (042)</u>							
Agawam	0030-003	14	5019	.182	.151	.146	9
Amherst	0060-002	14	4401	.165	.162	.140	7
*Chicopee	0400-008	14	8510	.192	.167	.160	13
*Ware	2360-002	14	8630	.213	.176	.167	17
<u>CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)</u>							
Worcester	2640-019	11	5022	.171	.139	.120	2
<u>METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)</u>							
*Chelsea	0380-003	14	7741	.150	.150	.149	6
Gloucester	0740-002	14	4120	.170	.155	.150	8
Sudbury	2196-001	14	4612	.170	.169	.150	10
<u>MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)</u>							
Lawrence	1000-005	11	4908	.144	.128	.126	4
Newburyport	1520-003	14	4995	.184	.159	.158	7
<u>SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)</u>							
Easton	0535-001	14	4724	.153	.129	.114	2
Fairhaven	0570-002	14	4624	.180	.161	.160	6
Scituate	2020-001	14	4753	.152	.151	.136	6
Truro	2275-001	14	4856	.182	.158	.158	12

* Monitor records ozone data for the entire year.

** When total observations are less than 3,852 the sample cannot be guaranteed to contain the actual maximum concentration value for the year. An observation is a single hourly reading at a site; 100 percent data capture during the 4/1 to 10/31 ozone season represents 5,136 observations at each monitor.

FIGURE 6: Continuous Air Sampling Network – Public 1988



Map produced by DEP DAQC and MassGIS – December 1989

D. NITROGEN DIOXIDE (NO₂)

1. Sampling Method

NO₂ is measured by the chemiluminescence detection principle. In this method, nitric oxide (NO) and oxides of nitrogen (NO_x) react with ozone and the resultant chemical products emit light. The intensity of this light is proportional to the concentrations of NO_x and NO. The electronically calibrated difference between NO_x and NO is equal to the NO₂ concentration. This methodology meets equivalency requirements published by EPA in 40CFR 50.11 (1981).

2. Summary of Data

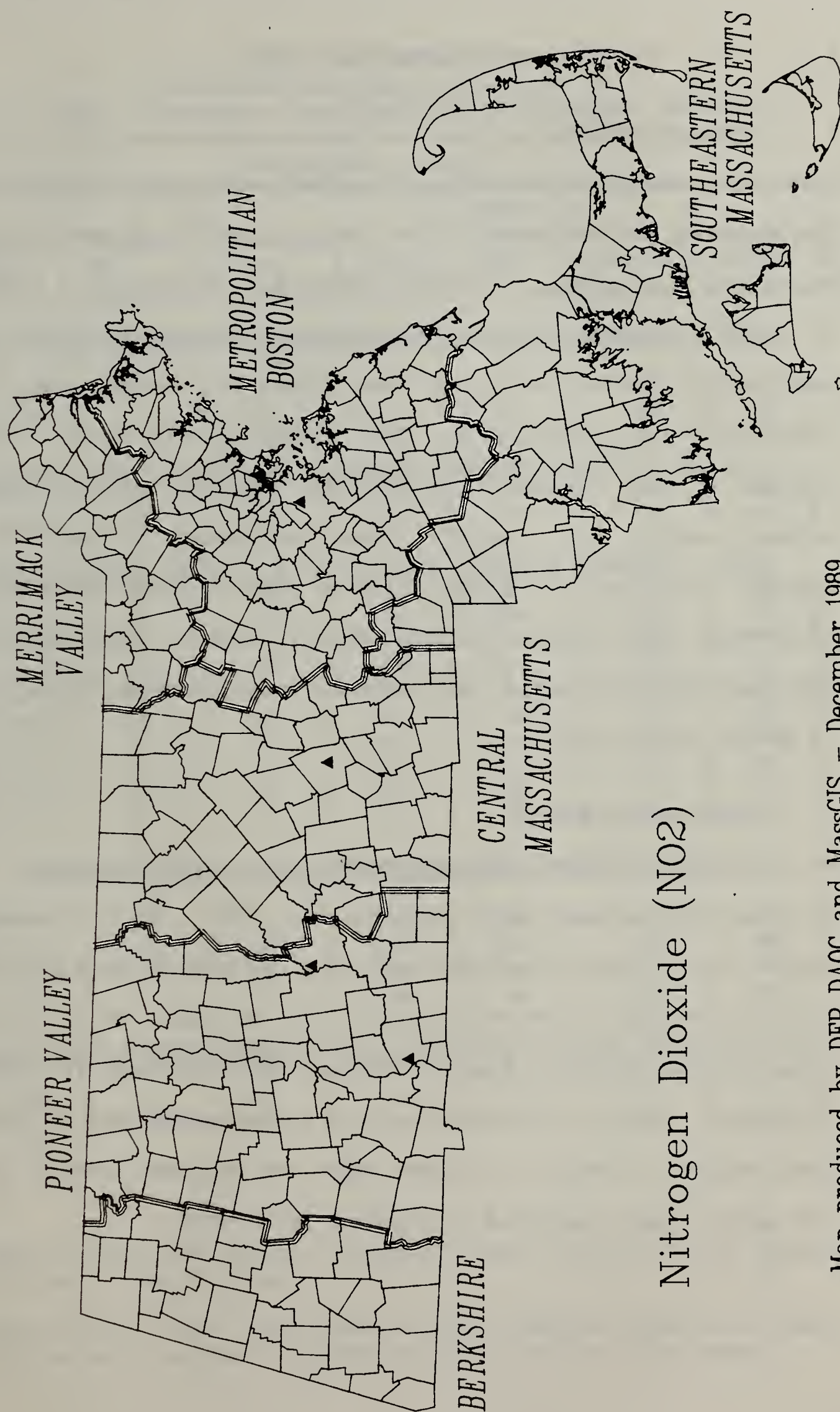
DAQC operated eight (8) NO₂ monitoring sites in 1988 (Figure 7). There were no recorded violations of the National Ambient Air Quality Standard (NAAQS) for NO₂ for the annual average of 100 ug/m³. Table 9 shows that the highest NO₂ level (470 ug/M³) was recorded in Worcester (2640-020).

(3) TABLE 9 - PUBLIC SITES

1988 NITROGEN DIOXIDE MONITORING RESULTS

NO ₂ Units: ug/M ³						
City	Saroad Site #	Instrument Method	Number of Hourly obs.	Maximum		Annual Arithmetic Mean
				1st hour	2nd hour	
<u>CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)</u>						
Worcester	2640-020	14	8121	470	399	55
<u>METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)</u>						
Boston	0240-002	14	6437	226	207	68
Boston	0240-021	14	8275	227	220	62
Chelsea	0380-003	14	7762	235	227	49
<u>PIONEER VALLEY AIR POLLUTION CONTROL REGION (042)</u>						
Springfield	2160-015	14	3121	165	156	*
Springfield	2160-016	14	3670	169	154	*
Springfield	2160-017	14	2429	376	376	*
Ware	2360-002	14	8487	154	152	17

FIGURE 7: Continuous Air Sampling Network – Public 1988



Nitrogen Dioxide (NO₂)

Map produced by DEP DAQC and MassGIS – December 1989

E. TOTAL SUSPENDED PARTICULATES (TSP)

1. Sampling Method

TSP measurements are routinely taken using the standard high volume air sampler method every sixth day. In this procedure, air is drawn through a pre-weighed 8"x10" fiberglass filter at a rate between 40 to 60 CFM for a period of 24 hours beginning at midnight. At the conclusion of the sampling, the filter is removed and transported to a laboratory for reweighing. The difference in weight in milligrams is divided by the volume of air passed through, giving a weight per unit volume result, i.e., ug/M³. Upon completion of the TSP (weight/unit volume) calculation, several other physical and chemical tests can be performed upon the collected sample, such as lead and sulfate content. This methodology meets equivalency requirements published by EPA in 40CFR 50.6 (1981).

2. Summary of Data

In 1988, twenty (20) TSP monitors were state-operated. Eighteen had at least 88 percent data capture for 1988. As TSP measurements are no longer regulated by standards, only collected data is reported here. The high values of Boston (0240-027) in Table 10 reflect highly active construction in this area. Fifteen TSP monitors in 1988 were privately operated (Figure 9). All the sites had at least 84 percent data capture. Table 11 shows that the highest annual geometric mean (63 ug/M³) was recorded at Boston (0240-018).

(3) TABLE 10 - PUBLIC SITES

1988 TOTAL SUSPENDED PARTICULATES MONITORING RESULTS

TSP Units: ug/M³

City	I Saroad I Sites	I Number I of I Obs.	I Minimum I Obs.	I 1st.	I 2nd.	I 3rd.	I Annual I Arith. I Mean	I Annual I Geo. I Mean
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CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)

Worcester	I 2640-013	I 60	I 9	I 132	I 93	I 92	I 48	I 43
Worcester	I 2640-016	I 61	I 23	I 119	I 97	I 93	I 56	I 52

MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)

Lawrence	I 1000-005	I 59	I 19	I 125	I 107	I 98	I 49	I 45
Lowell	I 1080-006	I 56	I 14	I 91	I 91	I 88	I 49	I 44

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Boston	I 0240-012	I 53	I 30	I 118	I 115	I 106	I 64	I 61
Boston	I 0240-021	I 58	I 24	I 115	I 108	I 106	I 62	I 58
Boston	I 0240-024	I 60	I 31	I 146	I 115	I 107	I 63	I 59
Charlestown	I 0240-027	I 60	I 38	I 410	I 207	I 187	I 103	I 94
Brockton	I 0320-003	I 60	I 17	I 92	I 81	I 77	I 43	I 39
Chelsea	I 0380-003	I 59	I 18	I 95	I 95	I 82	I 48	I 45
Medford	I 1220-002	I 60	I 26	I 140	I 134	I 104	I 62	I 57
Quincy	I 1880-007	I 57	I 18	I 112	I 91	I 83	I 46	I 42
Watertown	I 2380-005	I 50	I 14	I 107	I 82	I 76	I 39	I 36
Woburn	I 2620-002	I 59	I 12	I 92	I 89	I 86	I 46	I 42

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Holyoke	I 0860-007	I 56	I 14	I 112	I 104	I 99	I 49	I 45
Springfld	I 2160-011	I 60	I 26	I 126	I 126	I 100	I 59	I 56
W.Springfld	I 2475-003	I 60	I 21	I 116	I 113	I 98	I 54	I 49
Ware	I 2360-002	I 82	I 2	I 76	I 66	I 46	I 20	I 16

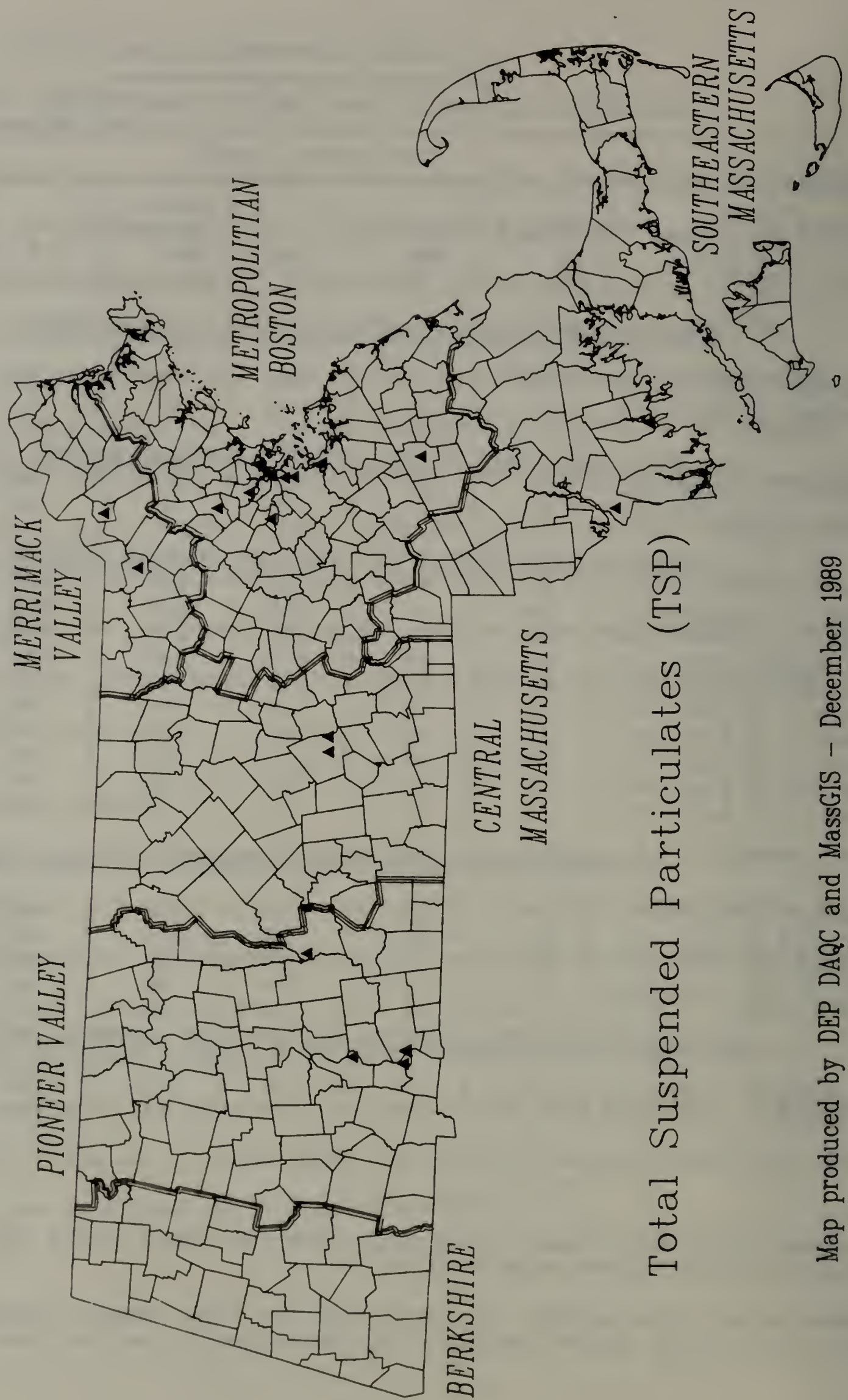
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)

Fall River	I 0580-001	I 50	I 22	I 97	I 79	I 72	I 44	I 42
N.Bedford	I 1500-004	I 57	I 22	I 101	I 71	I 64	I 41	I 39

* Annual Arithmetic Mean and Annual Geometric Mean could not be determined due to insufficient sample size.

** When total observations are less than 40, the sample cannot be guaranteed to contain the actual maximum concentration value for the year.

FIGURE 8: Continuous Air Sampling Network – Public 1988



Map produced by DEP DAQC and MassGIS – December 1989

(5) TABLE 11 - PRIVATE SITES

1988 TOTAL SUSPENDED PARTICULATES MONITORING RESULTS

TSP Units: ug/M³

Daily

City	I Saroad	I Number	I Minimum	I 1st	I 2nd	I 3rd	I Annual	I Annual
	I Site #	I of	I Obs.	I Max	I Max	I Max	I Arith.	I Geo.
	I	I Obs.	I	I Obs.	I Obs.	I Obs.	I Mean	I Mean

PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Chicopee	I 0400-006	I 59	I 24	I 160	I 105	I 101	I 57	I 53
Northampton	I 1600-003	I 56	I 14	I 118	I 90	I 87	I 44	I 39
Springfield	I 2160-009	I 60	I 21	I 128	I 87	I 82	I 49	I 46
Springfield	I 2160-012	I 59	I 24	I 99	I 98	I 87	I 51	I 48
Springfield	I 2160-013	I 58	I 20	I 115	I 66	I 95	I 53	I 48

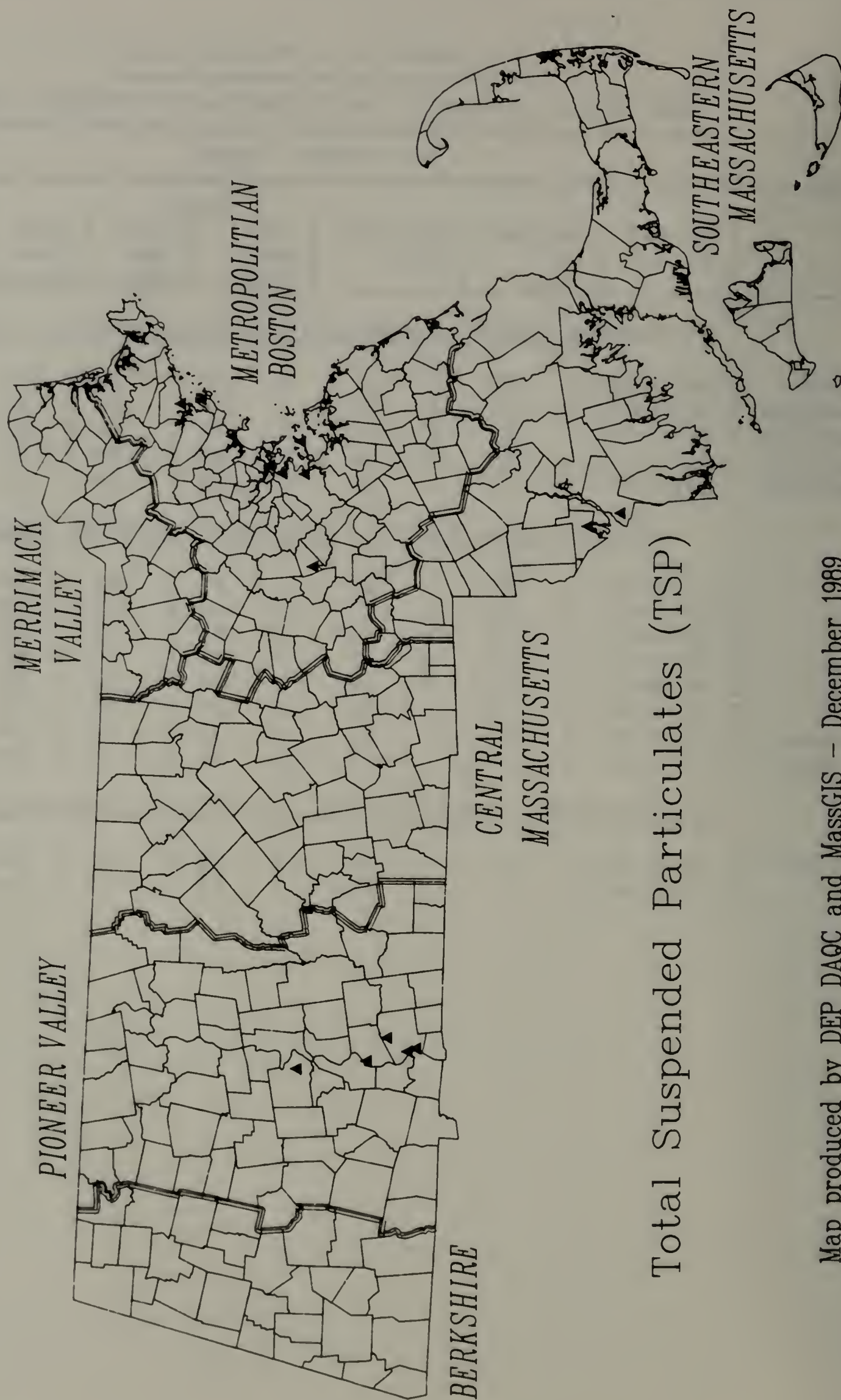
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION

Beverly	I 0220-002	I 30	I 15	I 78	I 66	I 54	I *	I *
Boston	I 0240-018	I 50	I 27	I 146	I 132	I 119	I 68	I 63
Boston	I 0240-019	I 49	I 10	I 82	I 67	I 61	I 31	I 29
Boston	I 0240-020	I 46	I 17	I 83	I 80	I 67	I 39	I 36
Boston	I 0240-021	I 49	I 18	I 102	I 92	I 92	I 48	I 44
Lynn	I 1100-003	I 58	I 10	I 138	I 125	I 114	I 59	I 51
Marblehead	I 1160-003	I 54	I 13	I 79	I 76	I 70	I 35	I 32
Wellesley	I 2420-001	I 60	I 11	I 78	I 77	I 677	I 32	I 29

SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION

Fall River	I 0580-014	I 51	I 18	I 74	I 70	I 66	I 40	I 38
Swansea	I 2230-001	I 59	I 13	I 82	I 57	I 54	I 28	I 26

FIGURE 9: Continuous Air Sampling Network – Private 1988



Map produced by DEP DAQC and MassGIS – December 1989

F. LEAD (Pb)

1. Sampling Method

Lead measurements are routinely taken using the standard high volume air sampler method every sixth day. In this procedure, air is drawn through a pre-weighed 8"x10" fiberglass filter at a rate between 40 to 60 CFM for a period of 24 hours beginning at midnight. At the conclusion of the sampling, the filter is removed and transported to a laboratory for reweighing. This analysis continues with the filter cut and placed in a nitric acid bath. The solution is then passed through an atomic absorption analyzer. This methodology meets equivalency requirements published in 40 CFR 50.12 (1981).

2. Summary of Data

In 1988, six (6) lead monitors were state-operated (Figure 10). No exceedances of the three-month National Ambient Air Quality Standards (NAAQS) for lead were recorded in 1988. Table 12 and Figure 11 show that the maximum quarterly level occurred in Boston (2160-027) with an arithmetic mean of .20 ug/M³.

(3) TABLE 12 - PUBLIC SITES

1988 LEAD MONITORING RESULTS

Pb units: ug/M3

City	Saroad Site #	Instrument Method	No. of Obs.	Maximum Obs.		Arithmetic Mean Quarter			
				1st	2nd	1st	2nd	3rd	4th

<u>CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)</u>									
Worcester	2640-016	92	58	.12	.10	.05	.04	.06	.05
<u>MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)</u>									
Lowell	1080-006	92	54	.11	.10	.05	.04	.05	.05
<u>METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)</u>									
Boston	0240-002	92	43	.14	.14	.07	.05	.07	.09
Boston	0240-027	92	52	.75	.40	.06	.06	.07	.20
<u>PIONEER VALLEY AIR QUALITY CONTROL REGION (042)</u>									
Springfield	2160-007	92	55	.23	.19	.12	.07	.09	.06
Springfield	2160-011	92	57	.22	.14	.06	.04	.06	.06

Figure 11:

QUARTERLY LEAD LEVELS - 1988

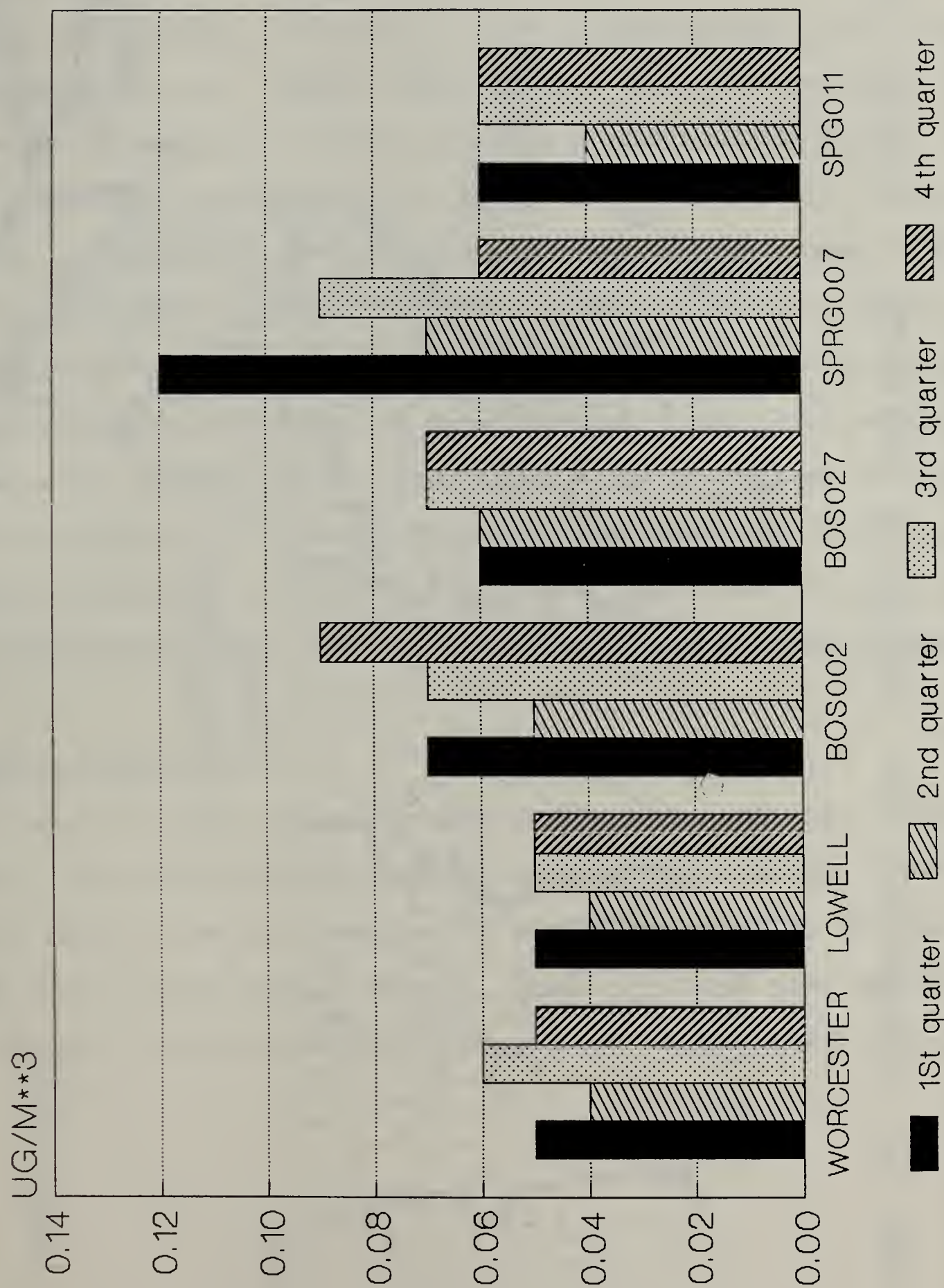
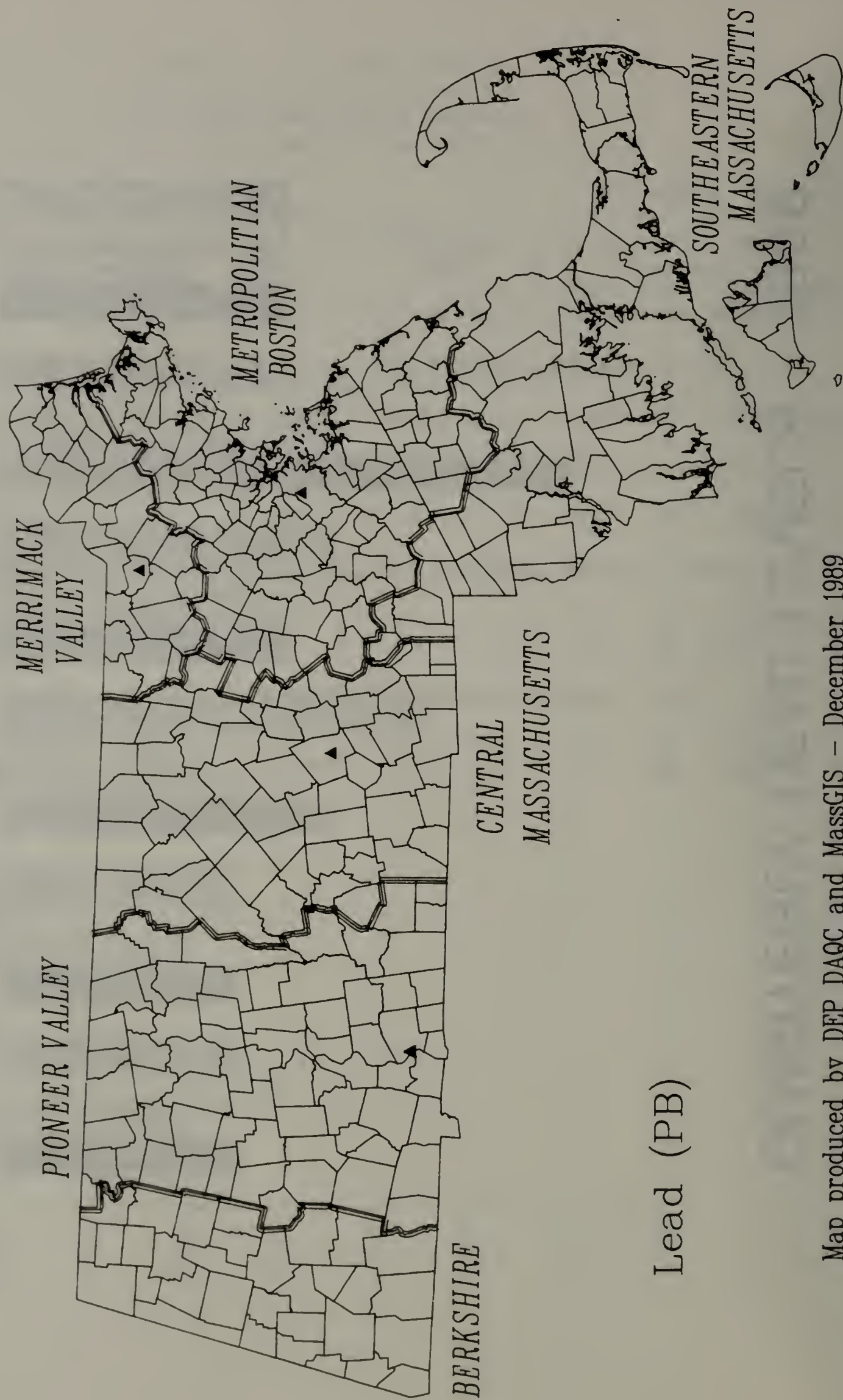


FIGURE 10: Continuous Air Sampling Network – Public 1988



Lead (PB)

Map produced by DEP DAQC and MassGIS – December 1989

H. SULFATES - PRIVATE SITES

1. Sampling Method

Sulfate measurements are taken at private monitoring sites using a standard high volume air sampler (Method 91). In this procedure, air is drawn through a preweighed, 8"x10" fiberglass particulate filter. The filter is placed in a beaker with 40 milliliters distilled, deionized water. This is covered for 30 minutes and then poured through a Whatman #42 filter into a 200 ml volumetric flask. Approximately 40 milliliters hot distilled, deionized water is added to a beaker, which is covered and left to sonicate for 10 minutes in an ultrasonic bath. The beaker and filter pieces are rinsed two or three times, and the diluent filtered and collected in a flask. At the conclusion of the sampling, the filter is removed and transported to the laboratory for analysis. The analysis involves turbidimetry using a Hach turbidimeter and sulfaver reagent.

2. Summary of Data

There were nine (9) privately-operated sulfate monitors in 1988 (Figure 12). The sites had at least 84 percent data capture. Sulfate monitors of these sites are operated by the Pioneer Valley Private Monitoring Group and by Boston Edison. Table 15 shows that the highest levels of sulfate were recorded at Chicopee (29 ug/M^3 , site 0400-006).

(3) TABLE 13 - PRIVATE SITES
=====
1988 SULFATE MONITORING RESULTS
=====

SO ₄ Units: ug/M ³										
City	I Saroad	I Number	I Minimum	I	Daily				I	I Annual
	I #	I of	I Obs.	I	I 1st.	I 2nd.	I	I 3rd.	I	I Arithmetic
	I	I Obs.	I	I	I Max.	I Max.	I	I Max.	I	I

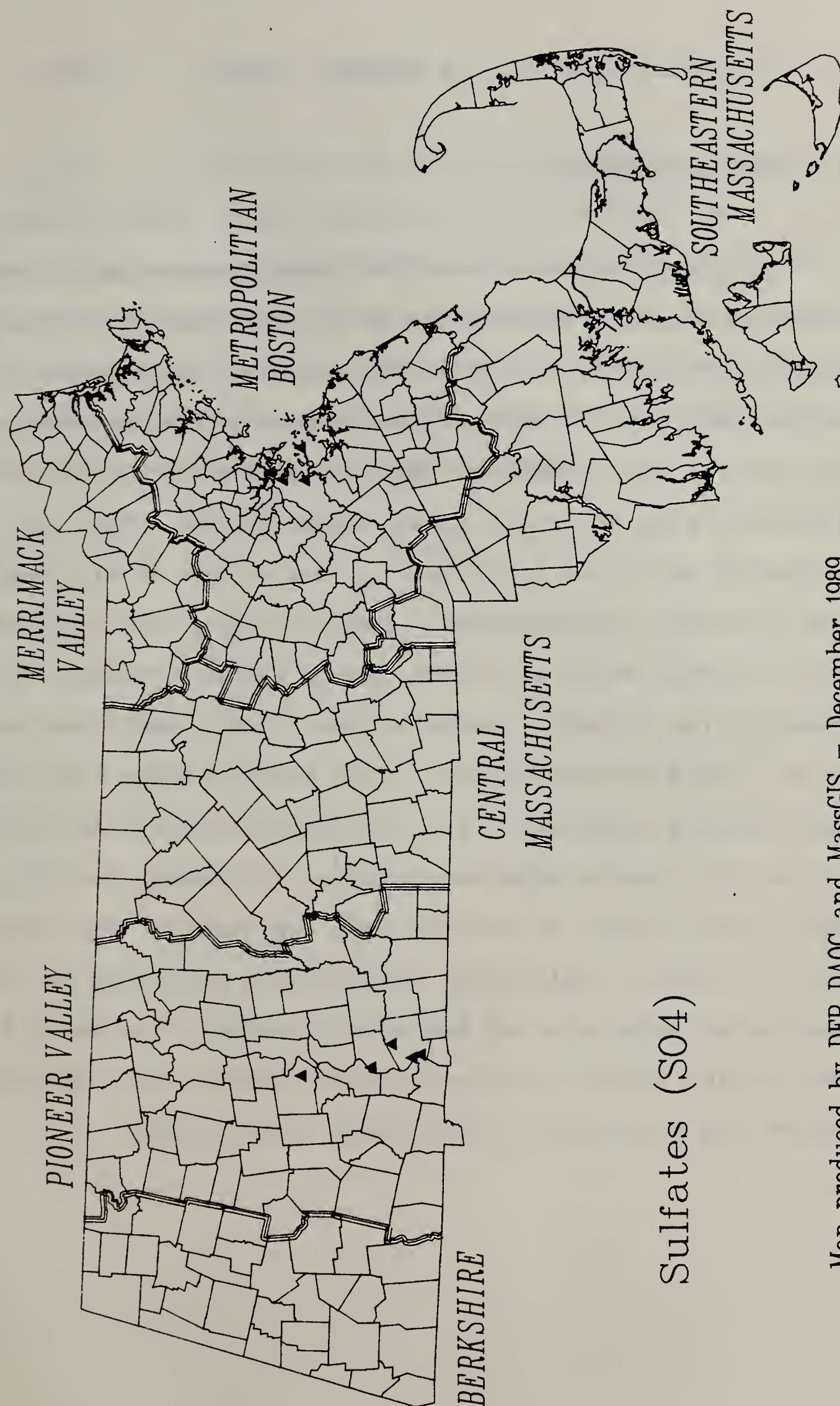
PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Chicopee	I0400-006I	60	I	2.3	I	29	I	25	I	15	I	10
N.Hampton	I1600-003I	58	I	2.2	I	24	I	21	I	19	I	9
Springfld.	I2160-009I	60	I	3.1	I	24	I	23	I	20	I	10
Springfld.	I2160-012I	59	I	3.3	I	24	I	21	I	19	I	10
Springfld.	I2160-013I	59	I	2.0	I	24	I	23	I	22	I	11

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Boston	I0240-018I	50	I	2.0	I	25	I	24	I	24	I	12
Boston	I0240-019I	49	I	4.0	I	23	I	21	I	70	I	11
Boston	I0240-020I	46	I	1.0	I	24	I	23	I	21	I	11
Boston	I0240-021I	49	I	5.0	I	24	I	24	I	23	I	12

FIGURE 12: Continuous Air Sampling Network – Private 1988



Sulfates (SO₄)

Map produced by DEP DAQC and MassGIS – December 1989

I. PARTICULATE MATTER ≤ 10 MICRONS (PM₁₀)

1. Sampling Method

DAQC employs size selective inlet devices (SSI), the high volume Anderson samplers (SA321A and SA321B) and the low volume Dichotomous sampler (SA 244E), to record PM₁₀ levels. PM₁₀ refers to particulate matter less than 10 micrometers in aerodynamic diameter. Thus, gravimetric measurement of PM₁₀ involves direct weighing of selected particles removed from a known volume of air. The total weight of collected particles is divided by the volume of air sampled to arrive at the pollutant concentration. Samples taken with the high volume method are collected on an 8x10 inch quartz filter. Though the Dichotomous sampler also filters a known volume of air, particles are collected on two 50 mm. round teflon filters. This method allows for distinction between particulates measuring 0-2.5 micrometers and 2.5-10 micrometers, collecting them on separate filters. To obtain the PM₁₀ total, particulate weight of both filters are summed. The Anderson sampler (SA 321B) meets equivalency requirements published by EPA in its "List of Designated Reference and Equivalent Methods," on March 7, 1988. Particulate matter is of such great concern since the small particle size allows the pollutant to lodge deep in the lungs.

2. Summary of Data

In 1988, eight (8) state operated sites monitored PM_{10} (Figure 13). Seven sites used the high volume (SA321A, SA321B) method. None of the sites exceeded the standard. Springfield (site 2160-007, $104 \text{ ug}/M^3$, daily) recorded the highest daily level (Table 16). Two sites, Boston (0240-002) and Ware (2360-002), used the Dichotomous sampler. The maximum 24 hour value recorded with this instrument occurred in Boston ($38 \text{ ug}/M^3$) for PM fine and in Ware (0240-002) ($22 \text{ ug}/M^3$).

TABLE 14 - PM10 PUBLIC SITES

1988 SUMMARY

PM₁₀ units: ug/M³

City	Saroad #	Instrument Method	Number of Obs.	Max Daily Obs.	2nd Max Obs.	3rd Max Obs.	Arith. Mean
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PIONEER VALLEY AIR QUALITY CONTROL REGION (042)

Springfld.	I 2160-007	I 58	I 54	I 104	I 90	I 79	I 39
Springfld.	I 2160-011	I 58	I 51	I 76	I 70	I 56	I 26

CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)

Worcester	I 2640-016	I 58	I 60	I 73	I 71	I 66	I 28
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METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)

Boston	I 0240-002	I 58	I 39	I 61	I 50	I 46	I **
Boston	I 0240-024	I 58	I 59	I 72	I 64	I 62	I 27
Charlestown	I 0240-027	I 58	I 58	I 79	I 77	I 69	I 32

City	Saroad #	Instrument Method	PM Range	Number of Obs.	Max Obs.	2nd Max Obs.	3rd Max Obs.	Annual Mean
------	----------	-------------------	----------	----------------	----------	--------------	--------------	-------------

METROPOLITAN BOSTON AIR QUALITY CONTROL REGION

Boston	I 0240-002	I 01	I 0-2.5	I 35	I 38	I 35	I 34	I *
	I	I	I 2.5-10	I 35	I 19	I 17	I 17	I *

PIONEER VALLEY AIR QUALITY CONTROL REGION

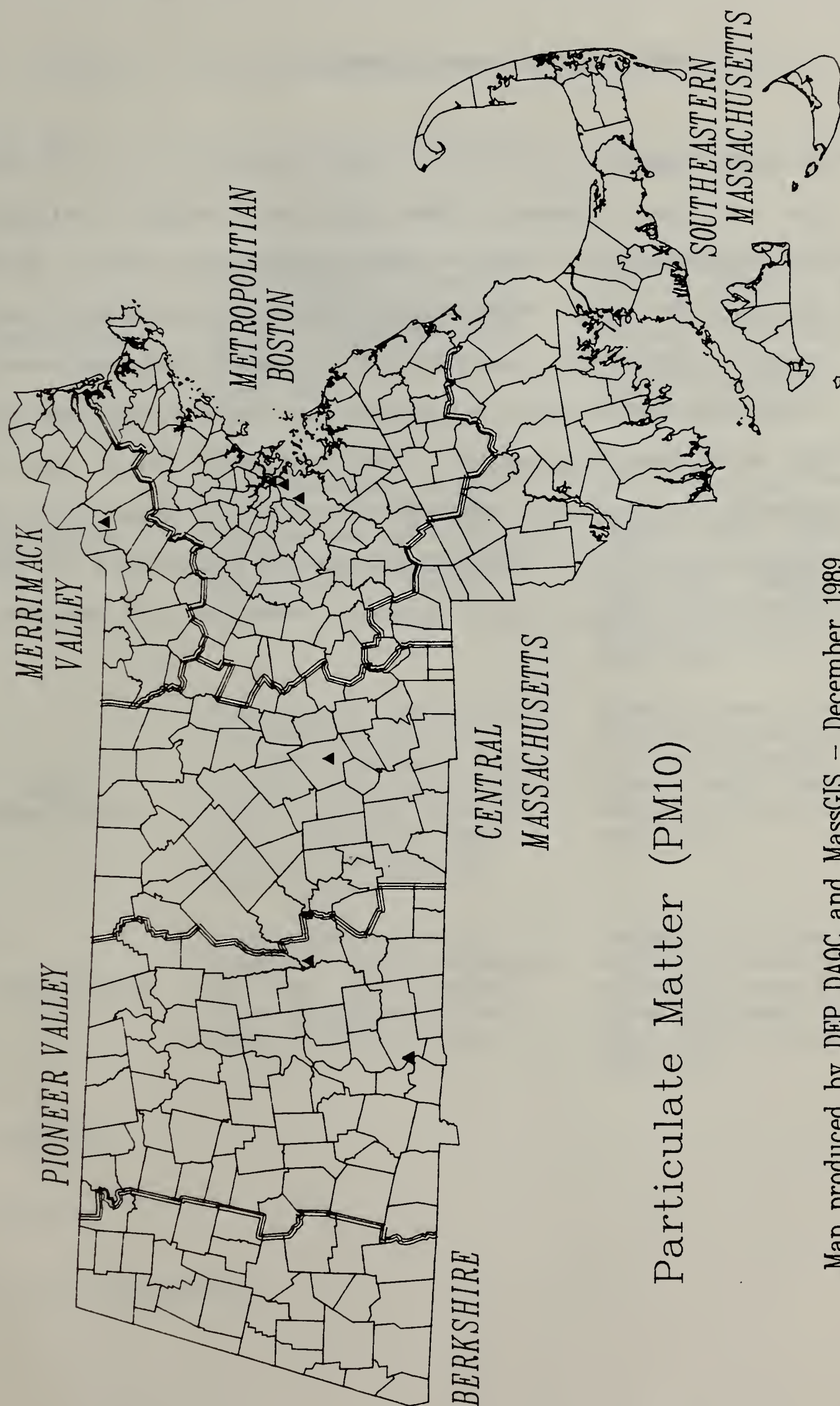
Ware	I 2360-002	I 01	I 0-2.5	I 29	I 22	I 18	I 15	I *
	I	I	I 2.5-10	I 31	I 8	I 6	I 5	I *

* Annual Mean could not be determined due to insufficient sample size.

** Total observations of 45 are required to have a 75% data capture.

A maximum data capture is 61 observations.

FIGURE 13: Continuous Air Sampling Network – Public 1988



Particulate Matter (PM10)

Map produced by DEP DAQC and MassGIS – December 1989

G. POLLUTANT STANDARD INDEX (PSI)

1. Definition

The Pollutant Standard Index provides a simple, uniform way to report concentrations of ozone -- the predominant form of photochemical oxidants or smog. Through its statewide ozone monitoring network, DAQC evaluates the previous day's ozone level and predicts the following day's ozone concentration based on the analysis, NOx values and on weather forecasts. A PSI value of 100 is equivalent to the national ambient air quality standard for ozone (.120 ppm). DAQC reports ozone PSI values daily during the months of April through October for three areas: Eastern, Central, and Western Massachusetts.

(2) TABLE 15 PSI Index and General Health Effects

Index Value PSI Descriptor *	General Health Effects	Cautionary Statements
500 hazardous	Premature death of ill and elderly. Healthy people will experience adverse symptoms that affect their normal activity.	All persons should remain indoors, keeping windows and doors closed. All persons should minimize physical exertion and avoid traffic.
400 hazardous	Premature onset of certain diseases in addition to significant aggravation of symptoms and decreased exercise tolerance in healthy persons.	Elderly and persons with existing respiratory diseases should stay indoors and avoid physical exertion. General population should avoid physical activity.
300 very unhealthful	Significant aggravation of symptoms and decreased exercised tolerance in persons with heart or lung disease with widespread symptoms in the healthy population.	Elderly and persons with existing heart or lung disease should stay indoors and avoid physical activity.
200 unhealthful	Mild aggravation of symptoms in susceptible persons, with irritation symptoms in the healthy population.	Persons with existing heart or respiratory ailments should reduce physical exertion and outdoor activity.
100 moderate		
50 good		
0		

* American Lung Association

TABLE 16: 1988 PSI by Region

This table represents the number of days during the ozone season (April-October) that fell into the good, moderate, and unhealthy categories. In 1988, there were no days in the very unhealthy category.

Month	PSI	Eastern Region	Central Region	Western Region
APRIL	Good	25	26	28
	Moderate	5	4	2
	Unhealthful	0	0	0
MAY	Good	16	16	12
	Moderate	15	15	17
	Unhealthful	0	0	2
JUNE	Good	9	15	15
	Moderate	14	11	11
	Unhealthful	7	4	4
JULY	Good	4	8	7
	Moderate	14	20	17
	Unhealthful	12	3	7
AUGUST	Good	6	12	9
	Moderate	18	13	16
	Unhealthful	7	6	6
SEPTEMBER	Good	15	25	23
	Moderate	15	5	7
	Unhealthful	0	0	0
OCTOBER	Good	17	30	29
	Moderate	4	1	2
	Unhealthful	0	0	0
TOTAL	Good	92	132	123
	Moderate	85	69	72
	Unhealthful	26	13	19

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